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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Etsuko KADOWAKI, et al.

Docket No: Q73675

Appln. No.: 10/540,028

Group Art Unit: 1796

Confirmation No.: 8868

Examiner: Peter D. Mulcahy

Filed: June 22, 2005

For: CURABLE COMPOSITION, CURED PRODUCT THEREOF, MOLDED PRODUCT THEREOF AND USE AS FUEL CELL SEPARATOR

SUBMISSION OF EXECUTED DECLARATION UNDER 37 C.F.R. §1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is an executed Declaration Under 37 C.F.R. §1.132 signed by Tadashi IINO and including attached samples. Applicant notes that this version of the Declaration includes corrections of typographical errors in the version filed in unexecuted form on April 14, 2008.

Respectfully submitted,

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Date: May 29, 2008

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DECLARATION UNDER 37 C.F.R. § 1.132

Mail Stop Amendment
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P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Tadashi IINO of SHOWA DENKO K.K., 13-9, Shiba Daimon 1-chome, Minato-ku, Tokyo 105-8518 Japan, declare and state:

That I am a research chemist having been awarded a master's degree from the post-graduate course of the Faculty of Industrial Chemistry, the Department of Science and Engineering, Chuo University in March, 1993, and have engaged in research on the application of a conductive polymer for a functional electrode, and

That I have been employed since April, 1993 by SHOWA DENKO K.K., 13-9, Shiba Daimon 1-chome, Minato-ku, Tokyo 105-8518 Japan, and have been engaged in research mainly on:

development of chlorinated polyethylene-based dynamic cross-linking thermoplastic elastomers in the Kawasaki Plastic Laboratory of the same company from May, 1993 to March, 1996;

development of carbon/resin composition in the Kawasaki Plastic Laboratory of the same company from April, 1996 to May, 1999; and

development of separator for fuel cell in the Kawasaki Plastic Laboratory, Corporate R&D Center and Production Technology Center of the same company from June, 1999 up to now.

To demonstrate the unexpected superiority of the present invention, the following experimentation was conducted by me or under my direct supervision.

Experimentation

1. Difference in physical property between 1,2-polybutadiene and cis-1,4-polybutadiene

In order to demonstrate the difference in physical property between 1,2-polybutadiene and cis-1,4-polybutadiene, I submit the following samples:

(A) Cured 1,2-polybutadiene (Peroxide Cure)

100 parts by weight of "JSR BR810" manufactured by JSR Co. Ltd., 2 parts by weight of (2,5-dimethyl-2,5-di(tert-butyl-peroxy)hexane, KAYAHEXA AD manufactured by KAYAKU Akzo Co. Ltd., cured at 160°C for 30 minutes under 50 ton pressure.

(B) 1,2-polybutadiene (Non-cured)

"JSR BR810" manufactured by JSR Co. Ltd., 100°C, pressed for 1 minute and then cooled.

(C) Cured cis-1,4-polybutadiene (Peroxide Cure)

100 parts by weight of "JSR BR01" manufactured by JSR Co. Ltd., 2 parts by weight of (2,5-dimethyl-2,5-di(t-butyl-peroxy)hexane, KAYAHEXA AD manufactured by KAYAKU Akzo Co. Ltd., cured at 160°C for 30 minutes under 50 ton pressure.

(D) Cis-1,4-polybutadiene (Non-cured)

"JSR BR01" manufactured by JSR Co. Ltd.

From these samples, it is clear that contrary to cis-1,4-polybutadiene, 1,2-polybutadiene, if it has been cured as a result of cross-linking the carbon-carbon double bonds in the side chain, becomes a cured product (having a Tg of 160°C or more and a bending strength of 30 MPa or more) having a three-dimensional network structure and does not exhibit a rubber-like property anymore.

2. Samples containing (B) a carbonaceous material

I also submit the following four samples in which a carbonaceous material (boron containing carbon) was incorporated:

Sample 1: 1,2-polybutadiene (RB810) cured

Sample 2: 1,2-polybutadiene (RB810) uncured

Sample 3: 1,4-polybutadiene (BR01) cured

Sample 4: 1,4-polybutadiene (BR01) uncured

The preparation conditions are shown the following table:

		1,2-PB		1,4-PB	
		Weight parts	Weight	Weight parts	Weight
Composition	RB810: 1,2-polybutadiene polymer (JSR)	100	21.4g		
	BR01: 1,4-polybutadiene polymer (JSR)			100	21.4g
	Kayahexa AD: curing agent or initiator (KAYAKUAKUZO)	5	1.07g	5	1.07g
	SCMG-IV: boron-containing carbon (SHOWA-DENKO)	600	128.6g	600	128.6g
Mixing Property[1], Labo Plastomill (100cc), 40rpm, 90°C, 5min.	Discharge Torque	53 N*m		26N*m	
	Energy Consumption	978MJ/m^3		381MJ/m^3	
	Discharge Temperature	111°C		98°C	
Green Sheet Forming Condition[2]		Press molding at 100°C		Press molding at 100°C	
Press Condition[3], 100*100*1mmt, 50t		180°C, 7min.		180°C, 7min.	

[1] Labo Plastomill Mixing Condition: The polymers were placed in a Labo Plastomill 500150 (Toyoseiki Co., Ltd.) heated at 90°C, stirred at 20 rpm for 5 minutes, to which the boron-containing carbon and curing initiator [Kayahexa AD: (2,5-dimethyl-2,5-di(t-butyl-peroxy)hexane) were added for about 5 minutes, and then stirred at 90°C, 40 rpm for 5 minutes to obtain the compounds.

2 Green Sheet Forming condition: The compounds mixed in Labo Plastomill are sandwiched between aluminum foils in 0.1 mm thick, and pressed in HOT PRESS (MHPC-V-450-450-1-50)(Meiki Seisakusho Co,Ltd.) to form sheets, wherein the pressure was adjusted so that the weight of the compounds cut in 95-99 mm square became 21 g.

3 Press Condition: The Green Sheets were sandwiched between super alloy plates in a frame of 100*100*1 mmt wherein the surfaces of the plates had been sprayed with a releasing agent (DAIFREE GA-6310, Daikin Industries, Co., Ltd.), pressed at 180°C, 50 t for 7 minutes, removed from the die, and sandwiched between SUS plates at room temperature to allow to be cooled.

The resultant 4 samples were harder than such samples that did not contain a carbonaceous material (i.e., the samples in part 1 above). However, the fact that the cured 1,2-polybutadiene was harder than the cured 1,4-polybutadiene remains the same.

Thus, I conclude that the present invention provides unexpectedly superior results.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: April 28, 2008 By: Tadashi Iino
Tadashi IINO